

4. Patricio

Program Name: Patricio.java

Input File: patricio.dat

Patricio lives in a dynamic world. The grounds on which he lives are magical and will shift a little bit each day. He has built a rocket and wants to know the best time and place from which to launch it. The best place to launch his rocket will be the place of highest elevation. Luckily, Patricio has lived here for a long while, so he has derived a mathematical formula to represent how the grounds will shift in the next few days. These formulas can sometimes be rather complex; he needs your help to determine when and where to launch his rocket.

The formulas are a function of position coordinates on the surface (x, y) and the day, represented by t. These formulas that Patricio has derived can contain parentheses, exponents(^), multiplication(*), division(/), addition(+), subtraction(-) and standard order of operation applies. Also, as a common shorthand, if there are two variables together without an operation between, multiplication is assumed.

Input: The first integer will represent the number of data sets to follow. The first line will be the expression of elevation derived by Patricio. The next line will be the maximum values for x, y, and z, respectively. Single spaces will separate all operands and operators.

Output: The sentence “**Patricio should launch at x=<the x coordinate of the highest elevation> and y=<the y coordinate of the highest elevation> at t=<the day Patricio should launch> at a height of <the maximum elevation at which Patricio can launch>.**” The x and y coordinate should be rounded to one decimal place, and t should be rounded to the nearest day (integer).

Assumptions: All division operations in Patricio’s formulas are floating point division; there is no integer division. Division by 0 is considered invalid, and is not considered infinity. The variables x, y, and t can be zero, but they cannot be negative. All formulas Patricio derives are dependent on x, y, and t.

Sample Input:

```
3
z = x^3 + 50x + t^2 + x^2y + x^y + xyt
5.0 5.0 10
z = x^2 + y^2 + t^2
10.0 10.0 100
z = -5x^2 + 4x + -5y^2 + 4y + -5t^2 + 4t
2.0 2.0 10
```

Sample Output:

```
Patricio should launch at x=5.0 and y=5.0 at t=10 at a height of 3975.0.
Patricio should launch at x=10.0 and y=10.0 at t=100 at a height of 10200.0.
Patricio should launch at x=0.4 and y=0.4 at t=0 at a height of 1.6.
```